Innovative Energy Management Strategies and Solutions—What We Have Learned from Leaders

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ABSTRACT

The main objective of this paper is to share and replicate innovative energy management practices and energy efficiency technology solutions that the US Department of Energy (DOE) learned from its industrial partners through the Better Plants Program. The DOE Better Plants program provides partners with technical support, recognition opportunities, and networking platforms. It offers multiple awards and events to recognize partners for outstanding accomplishments in industrial energy and water efficiency. The Better Project and Better Practice awards recognize partners for innovative and replicable energy efficiency projects and energy management practices that address one or more prevailing industrial energy efficiency challenges.

This paper summarizes the knowledge and lessons learned through award-winning projects and practices in 2017 and 2018. It provides information on the innovation, barriers overcome, magnitude of impact, project implementation strategy, and replicability. Details are presented for five case studies: Saint-Gobain's wireless sub-metering, Quad Graphics' baseload reduction, 3M's annual energy communication plan, TE Connectivity's center of excellence, and ArcelorMittal's energy management toolbox.

Introduction

The US Department of Energy's (DOE) Better Plants program is a voluntary partnership initiative to promote energy efficiency for manufacturing facilities (DOE 2011). By partnering with the program, partners commit to ambitious long-term energy efficiency improvement goals, typically 25% savings in 10 years. More than 215 industrial partners have joined the Better Plants program and they receive technical support, national recognitions, and networking opportunities.

The Better Plants program has multiple awards and events to recognize partners' outstanding achievements in industrial energy and water efficiency. The Better Plants program introduced the Better Project and Better Practice awards in 2017 and planned to select around six winners for each award each year (DOE 2017). These two categories of awards recognize partners for innovative and replicable energy efficiency projects and energy management practices that address one or more prevailing industrial energy management challenges.

This paper provides details on how the 2017 and 2018 Better Project and Better Practice awards winners overcame one or more key barriers to energy efficiency and the achieved energy savings. The purpose of this paper is to share and replicate innovative energy management practices and energy efficiency technology solutions from leaders in manufacturing energy

management and inspire more technological and organizational innovation to improve the energy efficiency of manufacturing facilities.

Overview of Industrial Energy Efficiency Barriers

Numerous organizations have evaluated common barriers to implementing energy management systems and energy/water efficiency projects (Rohdin and Thollander 2006; Sorrell, Mallett, and Nye2011; Chai 2012; Littlefield 2013; DOE 2015). The Better Plants program offers a publicly accessible database, Solution Center (DOE 2016), of solutions that have been developed by partners to address key industrial barriers. The Solution Center has broadly adopted the following 11 key items as major barriers. Figure 1 shows the number of solutions submitted by industrial partners for each barrier.

- Acquiring expertise outside of an organization
- Building expertise within an organization
- Engaging employees, occupants, and customers
- Financing or paying for a project
- Getting access to data and information
- Identifying or evaluating energy-saving technologies
- Metering/measuring energy use
- Motivating an organization
- Partnering with a utility company
- Reaching the surrounding community
- Using data (or technologies) to track progress

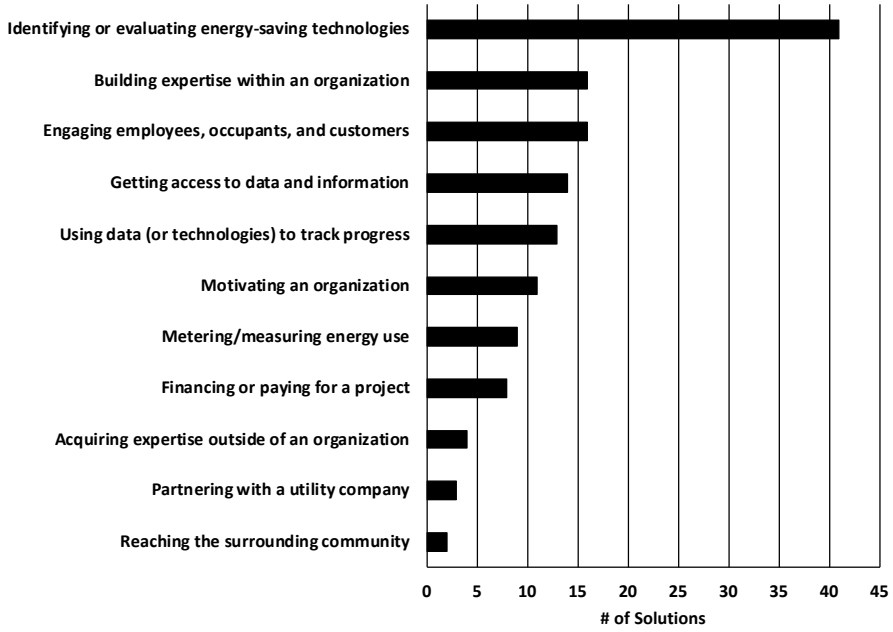

Figure 1. Solution Center Resources Provided by Industrial Partners

It can be observed that 41 (30%) of solutions are submitted for overcoming the barrier of identifying or evaluating energy-saving technologies, which implies a lot of interest from partners searching for, and deploying, effective and innovative technologies. That interest is why the Better Plants program introduced the Better Project award – to share and encourage innovative technologies that have great replicability and energy savings potentials.

"Building expertise within an organization," "engaging employees, occupants, and customers," and "motivating an organization" are the top three organizational barriers of interest. The Better Practice award was created to promote practices that enhance internal expertise development, employee engagement, and energy efficiency awareness.

Better Project and Better Practice Awards

These two awards honor partners' innovative and industry-leading energy efficiency work. Specifically, the Better Project award is presented to partners for outstanding accomplishments in implementing industrial energy efficiency projects at individual facilities. The Better Practice award recognizes outstanding accomplishments in implementing and promoting the practices, principles, and procedures of energy management in industry.

Applications are annually solicited by DOE in the spring timeframe. DOE utilizes the following project categories when soliciting for Better Project award applications:

- Traditional industrial energy systems (e.g., process heating, compressed air, steam, fans, motors, and pumps)
- Innovative and advanced technology (e.g., smart manufacturing, additive manufacturing, and reactive distillation)
- Combined heat and power systems
- Energy/water nexus (e.g., removing throttling valves on pumping systems and controlling flow with variable frequency drives)
- Non-energy benefits (e.g., productivity enhancements, maintenance cost savings, and reduced greenhouse gas emissions)

Since the Better Practice Awards are aimed at recognizing efforts to drive organizational and cultural changes in energy management, they must meet the following requirements and address one or more prevailing industrial energy management challenges:

- Best practices that demonstrate replicable pathways for the deployment of energy efficiency in an organization
- Address a key barrier to energy or water efficiency that was overcome, such as: lack of personnel awareness, utility inertia, etc.

Better Plants partners are given several months to develop and submit applications. The applications are reviewed by a DOE-led committee of 5-10 individuals and are scored based on four criteria: project background, innovation, replicability, and impacts. The award winners are applications with highest scores.

Through the first two years, the program has averaged six awards in each category, with winning organizations representing a variety of different partner sizes (small, medium, and large in terms of aggregated annual energy consumption) and sectors (chemical, primary metal, transportation equipment, and others). Awardees receive recognition certificates at the annual

Better Buildings Summit, and each are given an opportunity to present during the Better Plants sponsored conferences to encourage solution replication amongst other partners. To further drive information sharing and knowledge transfer, DOE also develops showcase projects and implementation models based on the information and data submitted in applications to the Better Project and Better Practice awards. These solutions are then uploaded into the DOE Solution Center to share with the entire manufacturing sector.

Overview of Award-Winning Solutions

Overall, five projects won the Better Project awards in 2017 and six in 2018. Six practices won the Better Practice awards each year in 2017 and 2018. Tables 1 through 4 summarize these award-winning projects, including the barriers overcome and estimated savings.

Table 1. 2017 Better Project Award Winners

Company	Systems	Project	Impact/Savings
C. F. Martin & Company	Heating, ventilation, and air conditioning (HVAC)	Upgrading HVAC system	40% annual energy savings for HVAC; improved product quality and decreased maintenance cost
Eastman Chemical Company	Steam	Improving the reliability of steam production by installing a new combustion turbine burner	156 TBTU annual energy savings
Ingersoll Rand	Lighting and HVAC	Upgrading lighting and HVAC systems across several facilities	2% annual energy savings
Narragansett Bay Commission	Renewable energy	Installing three 1.5 MW wind turbines	$600K annual electricity costs savings; hundreds of thousands of dollars revenue from renewable energy credit sales
Victor Valley Wastewater Reclamation Authority	Combined heat and power (CHP)	Installing a 1.6 MW CHP system fueled by biogas produced onsite	$473K annual energy cost savings

Table 2. 2018 Better Project Award Winners

Company	Systems	Project	Impact/Savings
Raytheon	Energy storage	Installing 1.9 MW and 3.1 MWh battery storage systems	$1,200 savings per month; a simple payback of 0.2 years

Company	Systems	Project	Impact/Savings
MedImmune	CHP	Installing a 2.5 MW natural gas–fired CHP system	13.9% annual source energy savings and $300K annual energy cost savings
Saint-Gobain Corporation	Metering and submetering	Implementing an advanced energy monitoring system with wireless submetering technology	14% annual energy savings from four identified projects
LA Bureau of Sanitation	Combined-cycle cogeneration	Hyperion bio-energy facility digester utilization project	37% energy intensity reduction for the Hyperion plant
JR Simplot	Manufacturing process	Replacing an older gypsum thickener system with a simpler design and variable speed capability	3.1M kWh annual electricity savings and 375M Gallons annual water savings
General Motors	Building automation	Upgrading building automation system from separate and distinct systems to a common building management system with advanced scheduling and operating technology	$213K annual electrical energy savings

Table 3. 2017 Better Practice Award Winners

Company	Barriers	Solution	Impact
Charter Steel	Little investment on low cost or no cost energy saving opportunities	Using an energy treasure hunt In-plant Training to simultaneously train employees, identify cost savings, and improve ISO 50001 implementation	Improved energy awareness among employees and cost savings
Harley-Davidson	Lack of strategic evaluation of energy consumption and waste production	Developing a multidisciplinary sustainability team	Helped achieve a 30% decrease in facility energy consumption
Johnson Controls	Challenge to continue improving energy efficiency	Establishing a company-wide energy treasure hunt program as part of the manufacturing system	Helped the company meet its Better Plants Challenge goal 2 years early

Company	Barriers	Solution	Impact
Nissan North America	Lack of formalized energy management system across the whole company	Implementing an enterprise-wide ISO 50001 Certified Energy Management System	Helped the company meet its Better Plants Challenge goal 5 years early
Saint-Gobain Corporation	Difficult to sustain employees' enthusiasm for energy efficiency	Creating WWE (Waste, Water, Energy) Award to inspire competition among 120+ manufacturing sites	Sites that have been engaged in the awards have shown noted improvement in the environmental categories
United Technologies Corporation	Absence of information about energy efficiency opportunities and sources to improve energy efficiency	Creating a multifaceted energy efficiency improvement program	Helped save millions of dollars in cumulative energy costs

Table 4. 2018 Better Practice Award Winners

Company	Barriers	Solutions	Impact
Owens Corning	Organizational barriers between plant energy teams and corporate energy program manager	Creating energy team challenge awards in the composites solutions business to encourage plant energy teams to participate in energy efficiency programs by measuring outcomes.	Empowered employees in saving energy and employee recognition
ArcelorMittal	Lack of a clear pathway and effective toolbox for each facility	Developing an energy management toolbox to engage, train, motivate, and prepare plant personnel.	Increased energy awareness among employees, helping them in identifying projects in their facilities
TE Connectivity	No full-time dedicated energy staff and short payback hurdle for energy efficiency projects	Developing a center of excellence to demonstrate and market the success of the energy treasure hunt approach in finding no-cost and low-cost energy efficiency improvements	Improved the adoption of proven energy savings projects

Company	Barriers	Solutions	Impact
Celanese	Lack of an energy assessment tool for sites with different competency and maturity in energy management	Energy management assessment matrix with 41 elements in a four-level hierarchy of competency levels	Identified strengths and weaknesses of energy programs and actions to improve
Quad Graphics	Insufficient attention paid to lower base energy consumption	Identified constraints to surveying, tracking, and analyzing base energy. Developed tools and resources to facilitate activities to reduce base energy	Realized significant energy savings from baseload energy reduction
Ingersoll-Rand	Insufficient attention to energy efficiency	Waco green team	70% energy savings for the Waco plant

Nearly all the selected Better Project awards involved significant capital improvements to upgrade systems to utilize new and emerging technology. Of the 11 awards made over the two years, six of the awards were in the area of innovative resiliency through the implementation of combined heat and power systems, renewables and/or storage, with each demonstrating significant energy cost savings. In addition, at least four of the selected projects included major upgrades to system metering, monitoring and automation.

Of the 12 Better Practice awards, 8 of the winning applications focused on developing a systematic process of directly engaging employees through innovative activities, such as: energy treasure hunts, awards, etc. Based on the applications, these direct contact activities help to instill a sense of individual ownership and responsibility and have helped slowly make a culture change within the respective organizations.

Most of the awarded projects and practices presented focused on solutions that overcame multiple barriers with a single activity or process. For example, Saint-Gobain's 2018 Better Project award on Metering and Submetering addressed the barriers of: "Building expertise within an organization," "Engaging employees, occupants, and customers," "Getting access to data and information," "Identifying or evaluating energy-saving technologies," "Metering/measuring energy use," and "Using data (or technologies) to track progress." Similarly, Charter Steel's 2017 Better Practice award on Energy Treasure hunts addressed multiple barriers, including: "Building expertise within an organization," "Engaging employees, occupants, and customers," "Identifying or evaluating energy-saving technologies," and "Motivating an organization."

Case Studies of Select Better Project and Practice Awards Winners

The following two sections will present five case studies of select award winners (Table 5) which were selected due to their high marks in the areas of Innovation, Replicability, and Impacts. Each case study provides a background summary of the project or practice, the relevant barriers and solutions, the implementation strategy, and the outcomes.

Table 5: List of Case Studies

Award Category	Company	Solution
Better Project	Saint-Gobain	Advanced Energy Monitoring with Wireless Submetering
Better Project	Quad Graphics	Reducing Base Energy Loads
Better Practice	3M	Annual Energy Communication Plan
Better Practice	TE Connectivity	Center of Excellence
Better Practice	ArcelorMittal	Energy Management Toolbox

Better Project Award Winners

Advanced Energy Monitoring with Wireless Submetering—Saint-Gobain

Background

Saint-Gobain, a building materials company, has a commitment to reduce company-wide energy consumption by 15% and carbon emissions by 20% by 2025 with 2010 as the baseline year. Its energy team has been continuously working to improve energy efficiency. However, almost all "low-hanging fruit" opportunities have been identified and addressed. To find less obvious opportunities and implement more sophisticated energy conservation projects, it was vital to install submeters to measure energy consumption at a more granular level than that of the utility meter.

Barriers and Solutions

Unfortunately, there are a few barriers to traditional submetering with physical wiring. The first barrier is the risk of production disruption caused by extensive physical wiring between the submeters and the central data collection system. The second barrier is that facilities have limited capital expenditure budgets and cannot afford to install equipment- and system- level submeters for all significant energy end-users for an entire whole facility.

By significantly reducing expensive physical wiring, wireless submetering technology was employed to minimize the risks of production disruption, expedite the implementation process, and reduce labor costs. The financial barrier was further addressed by developing a master service agreement with contractors to account for metering system installation and data visualization as a monthly or annual service fee, rather than a capital expense, which is attractive to sites with low capital expenditure budgets.

Implementation

Installing submeters at every electrical load in the plant is beneficial, but not economical or necessary. Sufficient numbers of submeters should be installed that the monitored total energy consumption can accurately mimic the site's actual energy curve.

To determine which electrical loads the plant would benefit from metering, the facility developed a load profile using a methodology similar to DOE's Energy Footprint Tool that provides electrical loads, operational hours with the subsequent electricity consumption, cost, and savings if electricity consumption was cut by an assumed 5%. The loads resulting in savings that were more than the cost of a sensor were chosen as metering points

Using this method, the pilot plant decided to install 49 wireless, self-powered sensors, coupled with a cloud-based analytics solution, on different electric loads within the facility that accounted for 75% of the electrical usage. The wireless sensors covered major electricity-consuming systems, including extruder zones and lines, HVAC panels, air compressors, and low-pressure blowers. Also needed were 12 bridges, which are used to communicate the sensor signal and communicate with the online server. An online dashboard was developed by the sensor manufacturer to allow the site to easily view the energy consumption trend.

Outcome

The equipment- and system- level real-time energy usage data led the site to identify and implement four energy reduction projects, which have the combined energy savings of about 14%. These four projects are enabling predictive maintenance, improving a manufacturing process, identifying identical equipment with different loads, and optimizing equipment use patterns. This technology also increased operational efficiency, product quality, and maintenance effectiveness.

Reducing Baseload Energy—Quad Graphics

Background

Baseload energy is the energy required when the production process at a facility is down. In theory, when production is down, a facility should consume minimal electrical and natural gas energy for phantom plug loads and HVAC systems required to maintain the building set-back temperatures. However, in reality, more items need to remain on when a production facility is down. Some examples are:

- Lighting in areas where maintenance personnel might be active
- Compressor operation for items that may need air (e.g., press dryer cylinders, press folder)
- Compressor operation to compensate system leaks
- Equipment, controllers, and drives that don't respond well to being powered down

Barriers and Solutions

Baseload energy is considered a non-value-added expense because it does not contribute to producing useful products. There will always be some baseload, but the intent is to reduce baseload energy to its minimum for each location. It is also understood that different facilities may have different practically achievable minimum baseloads, depending on system infrastructure, equipment types, and so on.

One Quad Graphics plant had begun targeting baseload in 2015, when a workload shift created opportunities to shut down production more regularly on weekends. The facility engineers tracked and analyzed the baseload operational data. In a quarterly energy call in 2016, they shared the energy cost savings achieved by shutting down unnecessary equipment when production was down. The significant savings prompted two questions: how are other plants performing regarding their baseloads, and how can other plants duplicate what this plant is doing.

The following constraints upon implementing baseload energy reduction were identified; they are addressed in more detail in the implementation section:

- Resources to perform baseload survey
- Resources to analyze energy consumption trends and quantify savings from proposed solutions
- Standard operation procedures (SOP) for employee training to ensure a clear understanding of which components can or cannot be powered down.

Implementation

The baseload survey templates for each department were developed. Although some of the tasks on the survey template may have been part of existing equipment checklists, they were repeated on the new list to ensure a second check. Surveys were to be initially performed by maintenance personnel with the expectation that production employees would be trained and able to assist. A surveyor would indicate whether a machine was down or running, how many items were out of compliance, and how many service orders were entered into the maintenance control software for repairs. Any equipment turn-off or turn-down restrictions deemed appropriate by the machine/machine group were to be confirmed with production personnel.

A training SOP for performing the baseload survey was developed, and an electronic template for documenting the frequency of nonconformities was created. A pareto diagram template was provided to track and address recurring issues. Top recurring issues and solutions for these issues are identified and displayed in plant conference rooms to increase visibility.

Outcome

Through concentrated auditing and working with the plant management team, weekend energy consumption significantly decreased for all participating plants. For example, one plant had reduced the baseload energy by 28% and annual electricity cost by 10%. Some plants reported over $200 annual energy cost savings per baseload survey hours.

Better Practice Award Winners

Annual Energy Communication Plan—3M

Background

3M reduced its energy intensity by 25% from 2005 to 2014 and it has committed to reducing energy intensity by an additional 30% in 10 years, with 2015 as the baseline year. 3M realizes that connecting all its facilities and staff members to move forward on a united front is critical to achieve this ambitious goal.

The intention of the annual energy communication plan was to increase the level of connection among 3M various locations on energy management and “turn up the volume” on energy efficiency–related discussions throughout the whole company.

Barriers and Solutions

3M’s corporate energy management program works with more than 275 locations in 70 countries, including about 90 locations in the United States. There are many barriers to effective communication, including difficulties in identifying appropriate messages for various levels of management within such a large organization, maintaining a rhythm of communication with the network of plant energy champions (the leaders on energy conservation efforts), communicating best practices, and scheduling communication events over various time zones. It can also be

difficult to connect with people, as corporate email distribution lists are not always managed in the same manner or maintained with the same rigor as one might expect.

The solution was to organize the communication efforts by creating an annual communication plan that focuses on promoting energy initiatives throughout the whole 3M location network. In the annual communication plan, 3M has created targeted, timed, and tracked messages for key stakeholders. The development and deployment of the annual communications plan is effective in achieving the objectives of increasing energy awareness, promoting an energy culture, broadcasting replicable energy-related opportunities, offering guidance, celebrating successes, and sustaining momentum toward achieving the energy efficiency goals.

Implementation

Existing communication tools have been updated to improve the effectiveness and new tools have also been developed. The following are some major updates and new tools:

- Added new topics and presenters to the monthly web conferences with plant energy champions
- Included new content in the energy-focused email blasts, such as success stories, implemented projects, training opportunities, recognitions, and tools
- Added new resources to energy SharePoint sites and 3M Go tools and resources, including
    - Energy implementation guide
    - Energy champion guidance
    - Lists of energy team roles and responsibilities
    - Archive of all web conferences and email blasts
    - Information on energy initiatives (3M-lead treasure hunts, ISO 50001 and SEP engagement, the 3M Lighting Challenge, and more)
    - Information on energy data reporting, tools for effective project delivery (including a quick analysis tool, application for corporate funding, best practices lists by technology type, and more)
- Developed an Excel workbook to contain all communication action plans and results.

Outcome

The implementation of the annual communication plan has led to a systematic and intentional directional change in how energy-related stories are communicated within 3M. For example, the attendance at energy web conferences, one of the many tracked metrics, has increased by 29% one year after the implementation.

Center of Excellence—TE Connectivity

Background

TE Connectivity (TE) is committed to improving energy efficiency throughout its global operations. Between 2010 and 2014, TE reduced absolute energy consumption by 19% and improved sales-normalized energy consumption by 30%. TE set a new goal, an additional 15% savings by 2018, with 2015 as the baseline year. TE wanted to establish a new approach to

aggressively and effectively promote best practices across over 100 sites and multiple business units and regions.

Barriers and Solutions

In a large organization like TE, attempts to share and promote best practices frequently fail to live up to their potential. One main reason is that the sharing platform has too much information to follow and implement (EDF 2010). Without significant efforts to review and control content, it is not easy to identify and implement useful and effective ideas.

TE created a Center of Excellence (COE) for the core manufacturing processes (TE 2017). The COE is composed of people from all parts of the business with expertise and/or interest in a COE topic, such as energy. The purpose of COE is to facilitate collaboration and sharing of expertise and best practices throughout all operations.

The COE selected a group of projects that had been implemented and achieved expected savings at one or more sites and could be replicated at others. Those are the ready-to-deploy (RTD) projects. For each project, the COE website provides resources for sign-up and project tracking. The COE/RTD website also provides detailed summary reports on deployments for use by management and others to improve the rate of success.

Process

There are several focus areas for TE's Energy COE. They include identifying and promoting the RTD projects; communicating more generally on energy reduction opportunities and challenges through periodic calls, meetings, and webinars; and hosting events for sharing among sites on energy reduction issues.

The Energy COE currently has below six RTD projects and will expand with new RTD projects.

- Upgrading to more efficient lighting systems
- Automating lighting systems controls
- Recovering waste heat from air compressors and other equipment
- Establishing a site energy champion and an effective energy team
- Detecting and repairing leaks in compressed air piping and other parts of the compressed air system
- Installing equipment shutoff mechanisms and establishing shutdown procedures

Tools and resources

A critical component for the success of the RTD project approach is support and engagement from management during the whole process. The COE/RTD website allows managers to easily view deployment activities by sites, topics, regions, and so on. It also tracks the savings associated with each deployed project. Sites have the option of indicating that the project is not applicable, has already been deployed, and so on. With the RTD approach, TE can strongly encourage RTD adoption without mandating.

Outcome

TE measures success in two ways: (1) it measures overall energy usage, efficiency, and progress toward goals and (2) it measures progress specifically for the COE/RTD projects. TE tracks the extent to which these projects are implemented across the company and the associated

estimated and achieved savings. Project adoption and results can be measured at the site, business unit, regional, or corporate level.

The Energy COE has proven extremely helpful in promoting the adoption of proven energy reduction projects, improving collaboration among plants, and identifying energy conservation opportunities to achieve energy reduction goals.

Energy Management Toolbox—ArcelorMittal

Background

Energy constitutes 20 to 40% of the cost of steel production. ArcelorMittal (2015), a steel manufacturing company, recognizes that improving energy efficiency reduces impacts on both operating costs and environment. It has committed to be a "responsible energy user that helps create a lower carbon future". ArcelorMittal has taken action on this commitment by joining the DOE's Better Plants program in 2013 and signing a voluntary pledge to reduce its energy intensity by 10% in 10 years. To achieve this goal, it has developed a comprehensive approach to energy reduction, which includes both capital projects and energy management activities (operational and behavioral) at the facility level.

Barriers and Solutions

Lack of in-house technical expertise is one of the major informational barriers to industrial energy efficiency (DOE 2015). Companies need to develop resources and train plant personnel how to use these resources to overcome this barrier. The ambitious goal established by ArcelorMittal cannot be achieved without engaged and well-equipped employees. Therefore, it has created many resources, essentially a toolbox consisting of various energy reduction tools, both theoretical and practical in nature. to equip its personnel and support each facility in improving energy performance.

Energy management toolbox

ArcelorMittal's toolbox approach to driving energy management initiatives was designed to engage and equip all levels of the organization, from leadership to the shop floor, with necessary data, resources, and training to meet the energy reduction goals. In a large, complex, energy-intensive company, it is critical to employ several diverse and complementary strategies, all underpinned by a spirit of teamwork and collaboration. Furthermore, in a capital-constricted business environment, actively engaging people—their talents, innovation and cooperation—has been a key strategy for continued progress. Therefore, the energy management initiatives have been approached by implementing the following tools.

- **Energy management technical best practices:** The Chief Technology Officer (CTO) department and energy managers at various sites worked together and developed ten best technical practices for different utilities with details on project implementation. They are stored on a company SharePoint site and employees are required to review regularly.
- **America's energy roundtable:** Every year ArcelorMittal (2017) hosts a roundtable where more than 50 energy personnel from all plants in the Americas (Canada, United States, Mexico, and Brazil) come together to share the implemented energy efficiency projects at their plants and explore opportunities to scale and replicate success elsewhere. They also discuss the common challenges and try to figure out the solutions collectively.

- **Global energy webinar:** ArcelorMittal coordinates a global energy webinar organized by the Global Energy Network every quarter. These webinars address new upcoming technologies and advancement in existing technologies. The topics can range from using drones for energy projects identification to safety associated with manufacturing processes. About 25 energy engineers, furnace operators, and energy managers join these webinars each time.
- **"Power of 1" contest:** October is recognized as Energy Awareness Month at ArcelorMittal. During this month, ArcelorMittal organizes a "Power of 1" contest across the United States. In this contest, employees are asked to submit their low-/no-cost energy savings ideas. These ideas are evaluated by the Global Energy Network and the winning ideas are rewarded. This practice encourages personnel to look for energy savings ideas and raise their energy efficiency awareness.
- **Partnership with Better Plants and Energy Star**: ArcelorMittal was the first iron and steel company to join the DOE Better Plants and Environmental Protection Agency Energy Star programs. The partnership with DOE's Better Plants program has opened up opportunities for ArcelorMittal (2018) to demonstrate leadership, create new and unique industry collaborations, and access valuable training opportunities.

Outcome

As of 2016, ArcelorMittal USA has already achieved more than a 4% cumulative improvement (1.3% average improvement per year) in energy intensity compared with the 2013 baseline year and is on track to achieve the Better Plants goal of reducing energy intensity by 10% by 2023.

With the use of the best practices and other resources in the energy management toolbox, energy awareness among employees is rising, helping the company identify projects across the country and the globe. The most powerful evidence is that many employee-generated Power of 1 low-/no-cost projects have been implemented in plants across the United States and have saved hundreds of thousands of dollars (ArcelorMittal 2016).

This multi-faceted approach has also created awareness and buy-in among upper management. As more financial value in the energy reduction efforts have been demonstrated, management has been approving more energy projects with quick returns. Approved energy projects have been adopted as a metric evaluated in every quarterly business review by company leadership.

Conclusions

DOE offers the Better Project and Better Practice awards to recognize solutions implemented by leading companies. DOE utilizes the awards to highlight innovative solutions to common energy efficiency and management barriers; this is accomplished by broadly sharing industry-developed lessons learned and encouraging replication and innovation by other manufacturing companies.

Over the past two years, 11 Better Practices awards and 12 Better Project awards have been presented to Better Plants partners. The Better Practice awards have highlighted innovative approaches to addressing business barriers, such as implementing energy treasure hunt programs to identify projects and train employees, implementing ISO 50001 enterprise-wide, and creating unique awards to inspire competition and build an energy-focused culture. The Better Project awards have recognized partners for implementing major, innovative projects, installing large

battery storage and CHP systems, installing onsite renewables, and implementing advanced metering and automation systems.

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